C.7 Hydrology

This section describes the existing conditions related to surface water hydrology and groundwater in the area of the proposed action (Project) and alternatives. Surface water and groundwater quality are described in Section C.12 (Water Quality and Resources).

C.7.1 Affected Environment

The Project area for surface water hydrology and groundwater includes the Littlerock Reservoir and Dam, Little Rock Creek downstream of the Dam to Rosamond Dry Lake, and the potential gravel pit and Palmdale Water District (PWD) disposal areas shown in Figures B-1 and B-2.

C.7.1.1 Climate

The climate of the Project area is characterized by long, hot, dry summers, and short, mild, relatively wet winters. Storms that have the potential to produce significant amounts of precipitation and flooding are extra-tropical cyclones of North Pacific origin, which normally occur from December through March. These storms often last for several days, and are capable of producing widespread precipitation. In addition to the extra-tropical cyclones, the area of the Project may receive thunderstorms, which can occur at any time of the year. Thunderstorms cover comparatively small areas, but result in high-intensity precipitation, usually lasting for less than three hours. On a smaller watershed, thunderstorms can produce flash flooding.

The average annual precipitation in the Palmdale area is 7.75 inches, with more than 12 inches possible in the local mountains, which include Littlerock Reservoir and the contributing watershed. More than 80 percent of all annual precipitation occurs between the months of November and March (SDLAC, 2005). Little precipitation occurs during summer.

C.7.1.2 Surface Hydrology

Little Rock Creek drains into the Antelope Valley Watershed, which is a 3,387-square-mile closed basin in the western Mojave Desert. Approximately 80 percent of the watershed has a low to moderate ground slope (0 to 7 percent). The remaining 20 percent consists of foothills and rugged mountains, some of which reach to over 9,000 feet in elevation. The floor of the Antelope Valley Watershed generally lacks defined natural channels outside of the foothills and is subsequently subject to unpredictable sheet flow patterns (SDLAC, 2005). The Antelope Valley Watershed has no outlet to the ocean. All water that enters the watershed either infiltrates into the underlying groundwater basin, or flows toward three playa lakes located near the center of the watershed. These playa lakes, Rosamond, Rogers, and Buckhorn, are usually dry, only containing water following large winter storms. Surface runoff that collects in the dry lakes quickly evaporates from the surface. Only a small quantity of water infiltrates to the groundwater due to the nearly impermeable nature of the playa soils (SDLAC, 2005).

Littlerock Reservoir provides water supply for the PWD and the Littlerock Irrigation District (SDLAC, 2005). The Littlerock Reservoir is approximately 95 acres in size (when full) and is located on Little Rock Creek near Palmdale, California. The reservoir is contained by Littlerock Dam, originally constructed in 1924. The watershed of Little Rock Creek at the reservoir is 63.7 square miles in area. Downstream of the reservoir Little Rock Creek flows north to northeast, intersecting an undergrounded segment of the California Aqueduct and the elevated State Route 138 (SR-138). Beyond SR-138, Little Rock Creek forms a large alluvial fan known as Little Rock Wash, eventually discharging into the Rosamond Dry Lake approximately 22 miles north of Littlerock Reservoir. The 100-year peak discharge of Little Rock Creek at the reservoir is 20,000 cubic feet per second (cfs) (Woodward Clyde, 1992).

Figure C.7-1 shows the Project site and the Littlerock watershed and drainages. Figure C.7-2 shows the Little Rock Creek 100-year floodplain (FEMA, 2008), delineated by approximate methods. Figure C.7-3 shows the maximum reservoir extent at spillway crest on 2013 topography.

Inflow to Littlerock reservoir occurs primarily in the winter months, typically beginning about midway through November and ending in June. Some residual flow, on the order of 1 cfs or less, may occur all summer. Median annual inflow to the reservoir, based on United States Geological Survey data for 1930 to 2005 (USGS, 2014) is 6,979 acre-feet, with average inflow 12,494 acre-feet. The observed annual inflow range from 1930 to 2005 is 432 acre-feet (1951) to 61,464 acre-feet (2005). About one year in six, on average, does not produce enough runoff to fill the reservoir.

Under current conditions, PWD has the right to annually divert 5,500 acre-feet of water per year from Littlerock Reservoir. Beginning when the reservoir has sufficient volume in late fall or early winter, PWD conducts water from Littlerock Reservoir to Lake Palmdale, located approximately 7.1 miles northwest of Littlerock Reservoir, by Palmdale Ditch (above ground culvert). Lake Palmdale acts as a forebay for PWD's water treatment plant, and stores approximately 4,250 acre-feet of State Water Project water and Little Rock Creek water (Aspen, 2005). The rate of water supply removal from Littlerock Reservoir is variable up to a maximum of approximately 50 cfs (design maximum), and averaging 9 to 10 cfs over an entire season (roughly December to September). Not all years produce enough water in the reservoir for PWD to take the entire allotment.

When Littlerock Reservoir is full, and inflow exceeds the outflow to Lake Palmdale, the excess water overtops the dam spillway into Little Rock Creek downstream of the dam. During wet years most reservoir inflow overtops the dam spillway and flows in Little Rock Creek toward Rosamond Dry Lake. During the summer, the reservoir is drained for water supply until a minimal recreation pool is reached. The recreation pool is maintained until Labor Day, after which the lake is further drawn down until it is effectively empty at the end of September.

Littlerock Reservoir currently (year 2013) has capacity for 3,037 acre-feet of water storage. This capacity has been diminishing over the years due to sediment inflow. Since 1992, 463 acre-feet of sediment have accumulated in the reservoir, giving an average accumulation rate of 22 acre-feet (36,000 cubic yards) per year. Since construction in 1924, approximately 1,564 acre-feet of storage have been lost to sediment accumulation.

The existing quarries into which Littlerock Reservoir sediment would be deposited are located in areas of the historic alluvial fan of Little Rock Creek, but these quarries are currently outside the 100-year floodplain (Figure C.7-2). The PWD property that would be used as a temporary sediment storage site is crossed by one small, unnamed ephemeral stream and has no mapped 100-year floodplain.

C.7.1.3 Groundwater

The Project site consists of a sandy streambed, which may hold water when saturated but is not considered to be an aquifer or source of groundwater. Geotechnical borings made in 2008 at the Rocky Point area of the lake, approximately 4,500 feet upstream of the dam, found groundwater 14.5 to 16 feet below the reservoir bed (URS, 2008). The Littlerock Dam foundation is on bedrock (Woodward Clyde, 1992), so it is likely any local groundwater located beneath the streambed upstream of the dam would be contained within the limits of Littlerock Reservoir by the dam.

Little Rock Creek flows into the Antelope Valley Groundwater Basin (Figure C.7-2), which is the principal groundwater basin for southeastern Kern County, City of Palmdale, and the portion of Los Angeles County surrounding the City of Palmdale. The basin is bounded on the northwest by the Garlock Fault zone at the base of the Tehachapi Mountains and on the southwest by the San Gabriel Mountains. To the east, the basin is bounded by ridges, buttes, and low hills, and to the north it is bounded by the Fremont Valley Groundwater Basin (DWR, 2004). The surface area of the Antelope Valley Groundwater Basin is approximately 1,580 square miles, extending across Kern, Los Angeles, and San Bernardino Counties (DWR, 2004). Most recharge of the Antelope Valley Groundwater Basin occurs at the foot of the mountains and hills by percolation through the head of alluvial fan systems. Eighty percent of natural recharge comes from mountain runoff attributed to Big Rock and Little Rock Creeks.

Portions of the Antelope Valley Groundwater Basin have experienced groundwater extractions and lowering of the groundwater table leading to subsidence in the past due primarily due to agriculture (USGS, 1998). Agricultural use has diminished substantially since the 1960s, although extraction for municipal use has increased (PWD, 1999). Little Rock Creek recharges the Pearland subunit of the Antelope Valley Groundwater Basin which, due to Little Rock Creek and Big Rock Creek flows, during wet years recovers completely from the past effects of pumping (PWD, 1999). PWD obtains approximately 40 percent of their approximately 26,700 acre-foot annual water supply from underground aquifers via 27 active wells in the Antelope Valley Groundwater Basin (Aspen, 2005).

C.7.2 Regulatory Framework

This section provides an overview of the regulatory framework for surface water and groundwater not related to water quality. Water quality is addressed in Section C.12 (Water Quality and Resources).

Table C.7-1 provides a list of plans and policies that are applicable to surface water and groundwater hydrology, and includes a discussion of the Project's consistency with each plan or policy. Section C.9 (Recreation and Land Use) contains an evaluation of policies within the Forest Service Land Management Plan that are applicable to hydrology.

U.S. Environmental Protection Agency

- **Clean Water Act.** The Clean Water Act, described in more detail in Section C.12.2.1, requires the development of a Storm Water Pollution Prevention Plan (SWPPP) requiring best management practices to prevent water quality degradation due to construction activities. Best management practices would apply to sediment control.
- **Watershed Protection and Flood Prevention Act of 1954.** This Act establishes policy that the Federal Government should cooperate with states and their political subdivisions, soil or water conservation districts, flood prevention or control districts, and other local public agencies for the purposes of preventing erosion, floodwater, and sediment damages in the watersheds of the rivers and streams of the United States; furthering the conservation, development, utilization, and disposal of water, and the conservation and utilization of land; and thereby preserving, protecting, and improving the Nation's land and water resources and the quality of the environment.
- **National Flood Insurance Act/Flood Disaster Protection Act.** The National Flood Insurance Act of 1968 made flood insurance available for the first time. The Flood Disaster Protection Act of 1973 made the purchase of flood insurance mandatory for the protection of property located in Special Flood Hazard Areas. These laws led to mapping of regulatory floodplains and to local management of floodplain areas according to guidelines, which include prohibiting or restricting development in flood hazard zones.
- **Executive Order 11988: Floodplain Management.** Executive Order 11988 requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide

leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

California Department of Fish and Wildlife (CDFW)

- Lake and Streambed Alteration Program. Section 1602 of the California Fish and Game Code protects the natural flow, bed, channel, and bank of any river, stream, or lake designated by the CDFW in which there is, at any time, any existing fish or wildlife resources, or benefit for the resources. Section 1602 requires an agreement between the CDFW and a public agency proposing a project that would:
  - Substantially divert or obstruct the natural flow of any river, stream or lake;
  - Substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or,
  - Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.
- The Streambed Alteration Agreement includes conditions necessary to protect stream or lake resources.

County of Los Angeles

- **County of Los Angeles General Plan.** The County of Los Angeles General Plan Safety Element includes provisions to discourage high-risk development in floodplains, minimize flood hazards, and ensure adequate flood control system capacity.
- **Antelope Valley Areawide General Plan.** The Antelope Valley Areawide General Plan encourages the use of floodplain areas for groundwater recharge, and limits other uses in these areas to extractive (sand and gravel), agricultural, or open space/recreational uses unless flood protective measures are included.

City of Palmdale

- **City of Palmdale General Plan.** The City of Palmdale General Plan contains a variety of provisions related to surface waters and groundwater. These primarily relate to preserving floodplain development safety and groundwater preservation. The City has developed a master drainage plan that all new development must be consistent with, and requires that new development be designed or modified so as to minimize the potential adverse impacts affecting floodplains, restore and preserve the natural and beneficial values served by floodplains, and to use measures that mitigate or reduce the risk of flood loss.

Table C.7-1. Consistency with Applicable Hydrology Plans and Policies

Plan/Policy	Consistency	Explanation
County of Los Angeles General Plan, Antelope Valley Areawide General Plan, and City of Palmdale General Plan General Flood Protection and Groundwater Protection Policies		
Various goals and policies to preserve floodplain development safety, ensure adequate flood control system capacity, minimize flood hazards, and preserve groundwater.	Yes	The Project would not alter the integrity of Littlerock Dam, nor would it involve the construction of any structure that would be subject to flood damage or induce flood damage on other property. Flow patterns would not be altered. The flood control capacity of Littlerock Dam would be increased. The ability of floodplain areas to serve as groundwater recharge conduits would not be altered.

C.7.3 Issues Identified During Scoping

Table C.7-2 below provides a list of hydrology issues raised during the public scoping period for the EIS/EIR [see Appendix E (Scoping Summary Report)]. Issues are listed by agency or members of the public providing comment. The table also includes a brief discussion the applicability of each issue to the environmental analysis and where that issue is addressed in the EIS/EIR.

Table C.7-2. Scoping Issues Relevant to Hydrology

Comment	Consideration in the EIS/EIR
Lahontan Regional Water Quality Control Board	
The Draft EIS/EIR should clearly define the 1992 baseline conditions identified in the scoping letter utilizing 1992 bathymetry of the lake, 1992 map of the topographic contours of the lake, or the 1992 contour and surface area of the lake's shoreline, as necessary.	Baseline condition year is 2013. The 2013 shoreline is shown in Figure C.7-3. Topographic mapping of the reservoir bed shows a capacity of 3,500 acre-feet water storage in 1995, and 3037 acre-feet in 2013. See Section C.7.1.2.
The Project is located within the Rock Creek Hydrologic Area of the Antelope Hydrologic Unit 626.00 and overlies the Antelope Valley Groundwater Basin No. 6-44. The Draft EIS/EIR should identify the beneficial uses of the water resources (per Chapter 2 of the Basin Plan) within the Project area, and include an analysis of the potential impacts to hydrology with respect to these resources.	Addressed in Sections C.7.1.2, C.7.4, and C.12.
Requests a Jurisdictional Delineation Report that describes the water resources on the Project sites and outlines the methodology used to define the extent of surface water features. A copy of this report must be submitted to the U.S. ACOE for verification.	Addressed in Section C.5.1.
In determining mitigation for impacts to waters of the State, consider Basin Plan requirements (minimum 1.5:1 mitigation ratio for impacts to wetlands) and utilize 12501-SPD Regulatory Program Standard Operating Procedure for Determination of Mitigation Ratios (ACOE South Pacific Division, Dec. 2012).	Addressed in Section C.5.1.
The EIR/EIS should evaluate a suite of alternatives to stabilize Little Rock Creek upstream of the dam. Stream channel stabilization practices, including various types of revetments, grade control structures, and flow restrictors, have been effective in controlling sediment production caused by hydromodification activities. Bioengineering techniques reduce flow velocities and scour by increasing sediment deposition. Bioengineering includes planting vegetation that forms dense mats of flexible stems such as willow to protect or rehabilitate eroded streambanks. Structural practices, both direct and indirect, protect or rehabilitate eroded streambanks and are usually implemented in combination to provide stability to the stream system. Indirect methods include grade control structures or hydraulic barriers installed across streams to stabilize the channel and control upstream degradation. Vegetative methods should be used in conjunction with or over structural methods because vegetation is relatively easy to establish and maintain, is visually attractive, and is the only streambank stabilization method that can repair itself when damaged. Other advantages to using vegetative erosion control over structural control include increased pollutant attenuation and nutrient uptake capacity, habitat for fish and wildlife, and added cultural resources. Additionally, hardening the banks of streams and rivers with shoreline stabilization protection such as stone riprap revetments can accelerate the movement of surface water and pollutants from upstream, thus degrading water quality in depositional areas downstream.	This is a design issue outside the scope of this impact analysis. The Project includes a grade control to stabilize the streambed upstream of the excavation. Aside from proposed bank protection at the grade control, no other bank protection is necessary. Within the reservoir erosion control measures downstream of the grade control are not needed due to low flow velocities (static or nearly static water) and the need to periodically return and excavate sediment to maintain capacity. The grade control structure is designed to withstand a discharge of 20,000 cfs at flow velocities of 15 feet per second. Vegetative measures may not be appropriate for long-term grade control under this circumstance.

C.7.4 Environmental Consequences

Significance Criteria. Appropriate criteria have been identified and utilized to make these significance conclusions based on the CEQA Appendix G Environmental Checklist, Initial Study and significance threshold guidance from the County of Los Angeles (County of Los Angeles, 1987) and relevance to this analysis based on local conditions and the project description. Not all of the standard Appendix G and Los Angeles County criteria are applicable. For instance, the Project does not involve the construction of housing. Standard criteria related to housing are not used. For purposes of the CEQA analysis in this analysis, hydrology impacts are considered significant if the Project would:

- Criterion H1: Substantially deplete groundwater supplies or interfere with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
- Criterion H2: Place within a watercourse or flood hazard area structures which would impede or redirect flood flows, or otherwise alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in erosion or siltation on or off site.
- Criterion H3: Increase the rate or amount of surface runoff or impede or redirect flood flows in a manner which would result in flooding on or off site, or otherwise create or contribute to runoff water which would exceed the capacity of existing or planned stormwater drainage systems.
- Criterion H4: Result in or be subject to damage from seiche or inundation by mudflow.

Impact Assessment Methodology. The impact analysis is based on an assessment of baseline conditions relevant to the site hydrology, presented in Section C.7.1, and an assessment of project-related and alternative-related effects on baseline conditions during project construction, long-term operation, and long-term maintenance using appropriate technical analysis and the impact significance criteria.

C.7.4.1 Proposed Action/Project

This section describes the direct and indirect effects related to surface water and groundwater hydrology in the area of the Project and alternatives. Direct and indirect effects to surface water and groundwater quality are described in Section C.12 (Water Quality and Resources).

Direct and Indirect Effects Analysis

Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted) (Criterion H1)

Impact H-1: The Project would deplete groundwater supplies downstream of the dam.

The Project would increase the storage capacity of Littlerock Reservoir by 463 acre-feet. Water diverted to Palmdale Lake would not be available for Antelope Valley Groundwater Basin recharge in Little Rock Creek downstream of the dam. The loss of this recharge could have an adverse effect on local groundwater levels and supplies downstream of the dam. Without implementation of the Project, PWD would need to rely more heavily on additional local groundwater pumping and water from the State Water Project.

PWD water removals can begin near the beginning of the annual runoff season, with ongoing replenishment from runoff during the winter, meaning total PWD removals can exceed the total capacity of the reservoir. As described in Section C.7.1.2, about one year in six (16 percent of all years) do not produce enough runoff to fill the reservoir. Based on USGS records, approximately 43 percent of the years (21 out of 49) do not produce sufficient inflow to Littlerock Reservoir to satisfy the PWD allotment. For these years there would be no difference between without Project and with Project conditions for downstream groundwater recharge. For the remaining 57 percent of the years with sufficient runoff to satisfy the Palmdale Water District allotment, approximately 463 acre-feet that under current conditions would annually overflow the dam spillway could be held in the reservoir for diversion to Palmdale Lake.

On average, for the entire 49 years of record, overflow volume available for infiltration to the Antelope Valley Groundwater Basin could be reduced by about 265 acre-feet annually as a result of the Project. Average annual recharge to the Antelope Valley Groundwater Basin is estimated at about 48,000 acre-feet per year (DWR, 2004). An average annual reduction of 265 acre-feet amounts to about 0.55 percent of the total overall recharge to this basin. This would be an indirect effect of the Project that would take place immediately after project completion.

The overall Project effect of about 0.55 percent reduction in water available for recharge to the Antelope Valley Groundwater Basin is expected to have minor effect on overall aquifer volume and groundwater levels, with no mitigation necessary. The Pearland subunit of the Antelope Valley Groundwater Basin, which is recharged by Little Rock Creek and Big Rock Creek, currently recovers completely from the past effects of pumping during wet years, so little or no effect is expected on groundwater levels. During dry years, there would be no change in dam overflow due to the Project, and no effect on groundwater recharge. Overall groundwater pumping by PWD would be offset by additional surface flow available from Littlerock Reservoir due to the Project, further reducing the effect of the impact.

CEQA Significance Conclusion

The Project-related reduction in Little Rock Creek water available to groundwater recharge would be minor, with little or no overall effect on aquifer volume or groundwater levels due to good recovery of the local groundwater subbasin in wet years, resulting in less than significant impacts (Class III).

Place within a watercourse or flood hazard area structures which would impede or redirect flood flows, or otherwise alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in erosion or siltation on or off site (Criterion H2)

Impact H-2: The Project would alter existing flow patterns, resulting in erosion and siltation.

The Project would alter Little Rock Creek flows within the boundary of Littlerock Reservoir by excavating up to 1,165,000 cubic yards of sediment from the reservoir bed, including an additional estimated 38,000 cubic yards annually, and install an in-stream, grade-control structure with associated bank protection. Sediments within the reservoir would be disturbed by the excavation, and local hydraulic conditions altered, potentially causing the remaining sediments to be subject to erosion and downstream deposition.

The effect of Impact H-2 on erosion and siltation would be negligible. No mitigation is necessary. All activities would be conducted within the limits of the reservoir, which, when full, has very low-flow velocity even during large floods (100-year flow velocity within the Project area would average less than one foot per second). The grade control structure and associated bank protection would be at-grade and not impede or redirect in-stream flow. The Project could induce local erosion when inflow occurs when the reservoir is empty or filling, due to steepening of the bed slope downstream of the grade control structure, but this erosion would be confined to the reservoir bottom and sides below the water surface with no anticipated damage to adjacent property. Eroded sediments would be confined to the reservoir bed by Littlerock Dam. Average flow velocities approaching zero at the dam would not be sufficient to raise transported bed sediments approximately 80 feet vertically to the spillway level to be transported downstream. Wash load (very fine) sediments disturbed in the bed could be transported over the spillway if the reservoir fills very rapidly from a dry condition, but stream gage records show that this would be a very uncommon condition. Overall, sediment transported downstream would be unaffected by the Project.

SPC HYDRO-1, provided in Appendix A, would ensure that excavated material to be stockpiled on the PWD alternate disposal site not obstruct or divert flow in the ephemeral watercourse that crosses that property. Compliance with the Federal Clean Water Act would ensure no sedimentation from the stockpile during construction. No Project-related erosion in this watercourse is expected. Sedimentation from the stockpile would be minor due to compliance with existing regulations.

SPCs Applicable to Impact H-2

SPC HYDRO-1 (Fill From Reservoir Excavation Will Not Be Placed in Stream Channels)

CEQA Significance Conclusion

The Project-related effect on erosion and siltation would be negligible. There would be no alteration of flood flows leading to erosion or siltation except for minor alterations within the reservoir itself. With the implementation of SPC HYDRO-1, impacts would be less than significant (Class III).

Increase the rate or amount of surface runoff or impede or redirect flood flows in a manner which would result in flooding on or off site, or otherwise create or contribute to runoff water which would exceed the capacity of existing or planned stormwater drainage systems (Criterion H3)

Impact H-3: The Project would alter Little Rock Creek flow volumes downstream of the dam, and otherwise alter stream flow characteristics, increasing the potential for flooding.

All new construction would be within the reservoir limits where induced flooding by diversion could not occur. The flow path within the reservoir would not be altered. The Project would not increase the maximum level of the reservoir. Although not specifically operated for flood control, the reservoir is emptied each year and, with a current capacity sufficient to contain the entire annual flow for approximately 16 percent of the years, the reservoir reduces the potential for downstream flooding by containing surface flows. The Project would increase the Littlerock Reservoir volume available to detain floods by 463 acre-feet (15 percent increase in volume), which would increase the flood-control capacity of the reservoir. The increase in flood control capacity would be a direct effect of the Project that would take place immediately after Project completion and be a beneficial effect on flooding downstream of the dam.

CEQA Significance Conclusion

The Project would have a reducing effect on downstream flooding, resulting in a beneficial impact (Class IV).

Result in or be subject to damage from seiche or inundation by mudflow (Criterion H4)

There is no impact under Significance Criterion H4. The Project would not alter the lake in a manner to increase the potential for seiche, nor would the Project include any structures or other above-ground structures or uses that would be subject to seiche damage. Mudflow inundation may be possible in the surrounding hills, but the Project would make no alteration of terrain that would cause mudflow or produce any structures that would be subject to mudflow. Some local earth displacement may be possible below the reservoir level, but these would be within the reservoir floor where no damage is expected.

C.7.4.2 Alternative 1: Reduced Sediment Removal Intensity Alternative

Direct and Indirect Effects Analysis

Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted) (Criterion H1)

Impact H-1: The Project would deplete groundwater supplies downstream of the dam.

Impact H-1 impacts and CEQA significance for Alternative 1 are the same as those described for the Project. See Section C.7.4.1.

CEQA Significance Conclusion

Impacts for Alternative 1 are the same as those described for the Project, less than significant (Class III).

Place within a watercourse or flood hazard area structures which would impede or redirect flood flows, or otherwise alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in erosion or siltation on or off site (Criterion H2).

Impact H-2: The Project would alter existing flow patterns, resulting in erosion and siltation.

Impact H-2 impacts and CEQA significance for Alternative 1 are the same as those described for the Project. See Section C.7.4.1.

SPCs Applicable to Impact H-2

SPC HYDRO-1 (Fill From Reservoir Excavation Will Not Be Placed in Stream Channels)

CEQA Significance Conclusion

Impacts for Alternative 1 are the same as those described for the Project, less than significant (Class III).

Increase the rate or amount of surface runoff or impede or redirect flood flows in a manner which would result in flooding on or off site, or otherwise create or contribute to runoff

water which would exceed the capacity of existing or planned stormwater drainage systems (Criterion H3)

Impact H-3: The Project would alter Little Rock Creek flow volumes downstream of the dam, and otherwise alter stream flow characteristics, increasing the potential for flooding.

Impact H-3 impacts and CEQA significance for Alternative 1 are the same as those described for the Project. See Section C.7.4.1.

CEQA Significance Conclusion

Impacts for Alternative 1 are the same as those described for the Project, resulting in a beneficial impact (Class IV).

Result in or be subject to damage from seiche or inundation by mudflow (Criterion H4)

Alternative 1 has no impact under Significance Criterion H4 for the same reasons described for the Project in Section C.7.4.1.

C.7.4.3 Alternative 2: No Action/No Project Alternative

Direct and Indirect Effects Analysis

Under the No Action/No Project Alternative, sediment would continue to accumulate in Littlerock Reservoir to the point where eventually the reservoir would fill with sediment and become inoperative as a water-supply reservoir. Assuming current and past accumulation rates of sediment, complete filling should occur between 90 and 128 years from the present, although it is likely the reservoir would become impractical for water supply sooner. Reservoir capacity would diminish each year, resulting in increased PWD reliance on groundwater. Sudden inflows of large amounts of sediment, as could occur after a large fire on the watershed, could dramatically and rapidly reduce the expected future lifespan of the reservoir.

At some point in the future, probably much less than the 90 to 128 years expected time to fill, PWD may need to make alterations to their outlet and conveyance system to continue to collect and convey water after the existing outlet is covered with sediment. At the time the reservoir becomes completely inoperable with the No Action Alternative, the 5,500 acre-feet maximum that PWD can divert from Littlerock Reservoir each year would likely be compensated by increased groundwater pumping and use of State Project Water unless another water source is found. State Water Project water, the third source of PWD water, faces an uncertain future due to increased population, environmental demands, and uncertain climate conditions.

CEQA Significance Conclusion

The No Action/No Project Alternative would eventually result in an increased reliance on groundwater extraction and State Project water to supply the greater Palmdale area, resulting in potential impacts associated with declines in groundwater levels from necessary additional extraction. Impact H-1 is significant and unavoidable (Class I) with the No Action/No Project Alternative. Impact H-2 would not occur with the No Action/No Project Alternative. Under the No Action/No Project Alternative, sediment accumulation and the eventual filling of Littlerock Reservoir with sediment would eventually eliminate the flood-control capacity of Littlerock Reservoir. With all water storage capacity lost, Littlerock Flows would pass over the reservoir undiminished, with a corresponding increase in the flood hazard downstream of Littlerock Dam. Impact H-3 is significant and adverse (Class I) with the No Action/No Project Alternative. The No Action/No Project Alternative has no impact under Significance Criterion H4.

C.7.5 Impact Summary

Impacts H-1 and H-2 for the Project and Alternative 1 are adverse, but not significant (Class III), and the No Action Alternative would have no effect associated with Impact H-2. Impacts H-1 and H-3 are significant and unavoidable (Class I) with the No Action/No Project Alternative. Impact H-3 is beneficial for the Project and Alternative 1. Table C.7-3 summarizes impact significance.

Table C.7-3. Summary of Impacts and Mitigation Measures – Hydrology

Impact	Impact Significance				Mitigation Measures/SPC
	Proposed Action	Alt. 1	Alt. 2: No Action	NFS Lands[1]	
H-1: The Project would deplete groundwater supplies downstream of the dam	Class III	Class III	Class I	No	None
H-2: The Project would alter existing flow patterns, resulting in erosion and siltation	Class III	Class III	No Impact	Yes	SPC HYDRO-1 (Fill From Reservoir Excavation Will Not Be Placed in Stream Channels)
H-3: The Project would alter Little Rock Creek flow volumes downstream of the dam, and otherwise alter stream flow characteristics, increasing the potential for flooding.	Class IV	Class IV	Class I	Yes	None

Notes:
1 - Indicates whether this impact is applicable to National Forest System lands.